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(54) **Biological or chemical test sticks**

(57) Stick has a core comprising (a) a liquid-permeable core member at one end in longitudinal alignment with (b) a liquid-impermeable core member, and around the core a sleeve comprising (c) a liquid-permeable layer in communication with the liquid-permeable core member and carrying at least one reagent and (d) an outer liquid-impermeable layer through which visible reaction products of said reagent(s) will show.

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TEST DEVICE

This invention relates to a device of the type for testing a fluid by formation of visible reaction product due to interaction between the fluid or a species therein and reagent carried by the device.

The invention provides, in one preferred class of embodiment, a biological or chemical test stick of this type having a (preferably substantially cylindrical) core comprising [a] a liquid-permeable core member (e.g. plug, rod or tube) at one end in longitudinal alignment with [b] a liquid-impermeable core member (e.g. plug, rod or tube), and around the core a sleeve comprising [c] a liquid-permeable layer in communication with the liquid-permeable core member and carrying at least one reagent and [d] an outer liquid-impermeable (and e.g. transparent or translucent) layer through which visible reaction product of reagent(s) and test fluid or species therein will show.

In use the end [a] can be inserted into a fluid to be tested, the liquid-permeable core member acting as a wick and transferring liquid to the surrounding liquid-permeable layer [c]; the liquid permeates layer [c] and encounters the reagent(s) carried thereby to give through layer [d] a visible indication of the condition (e.g. pH) of the liquid or of the presence and/or concentration of a targeted species in the liquid.

The liquid-permeable layer [c] may carry one or more diagnostic or other reagents. The or each such reagent will usually be confined to one or more restricted zones of [c], e.g. to a circumferential ring or rings; where a plurality of reagents is employed, they may be in separate zones, or two or

more may be present in the same zone; the or each reagent zone on layer [c] will preferably be over the liquid-impermeable core member [b].

The core and sleeve of a said preferred stick according to the invention will usually be co-terminous, but liquid-permeable core member [a], or this rod or plug [a] and liquid-permeable layer [c] of the sleeve, might protrude at one end.

The liquid-permeable core member [a] could for example be of gathered creped paper, cotton wool, or filamentary tow; the material might be bonded to itself so as to form a rod or plug or tube which is coherent and dimensionally stable in the absence of a wrapper, it could be pre-formed with its own wrapper (which would of course be such - e.g. of liquid-permeable material and/or perforate etc. - as to permit liquid communication between the interior and surrounding sleeve layer [c]), or could be held in rod or plug form by the said sleeve.

The liquid-impermeable core member [b] could for example be of closed-cell plastics foam. It will usually be inherently dimensionally stable without a wrapper, but as with [a] it could be pre-formed with its own wrapper or held in shape by the said sleeve.

The liquid-permeable layer [c] of the sleeve may for example be of filter paper or chromatography paper. A transparent or translucent sleeve layer [d] may for example be of clear plastics film, e.g. of polyester or polyethylene. Layers [c] and [d] may be pre-laminated before application around the core; layer [c] might instead be a coating applied

to layer [d] before application of the composite sleeve around the core.

A said preferred test stick according to the invention can be made continuously by continuously forming and advancing longitudinally a core of alternating member [a] and [b], concurrently and continuously longitudinally advancing the sleeve and applying it around the core (e.g. by means of a garniture), and cutting the resulting continuously produced composite stick into finite lengths. In a modification the core is first wrapped in sleeve layer [c], and sleeve layer [d] is subsequently applied (e.g. by wrapping in similar manner or by extrusion) before the composite is cut into finite lengths.

Test sticks according to the invention can be used for a wide variety of diagnostic/chemical/clinical tests, according to the nature of reagent(s) employed with layer [c]. Thus indicators may be used as reagent to provide a stick for pH testing; or the stick may be used for pregnancy testing, layer [c] carrying appropriate antibodies as reagent for interaction with hormones in urine.

Various modifications of the above-described preferred stick are possible. Thus all of the core may be liquid-permeable, though preferably with a portion [b] which is less so than portion [a]; where all of the core is liquid-permeable, a downstream portion preferably has a liquid-impermeable surface or wrap within sleeve [c]. In another variation, liquid-permeable core portion [a] is omitted, so that the test liquid is taken up solely and directly by sleeve layer [c]; in this case the core portion [b] could be permeable or impermeable, though in the former case it preferably has an impermeable skin or wrap. In

another variation, the whole of the core is liquid-impermeable; in this case sleeve layer [d] will preferably be perforate or apertured at one end to allow easier access of test liquid to the sleeve layer [c] - this being a feature which could be employed in all described embodiments.

Accordingly, in a broad aspect, the invention provides a biological and/or chemical test stick having a (preferably substantially cylindrical) core and around the core a sleeve comprising [i] a liquid-permeable layer carrying at least one reagent and [ii] an outer liquid-impermeable layer through which visible reaction product of said reagent(s) will show, layer [i] being exposable to contact with a fluid to be tested. The core is, usually of circular section.

CLAIMS :

1. A biological and/or chemical test stick having a core and around the core a sleeve comprising [i] a liquid-impermeable layer carrying at least one reagent and [ii] an outer liquid-permeable layer through which visible reaction product of said reagent(s) will show, layer [i] being exposable to contact with a fluid to be tested.

2. A biological and/or chemical test stick having a core comprising [a] a liquid-permeable core member at one end in longitudinal alignment with [b] a liquid-impermeable core member, and around the core a sleeve comprising [c] a liquid-permeable layer in communication with the liquid-permeable core member and carrying at least one reagent and [d] an outer liquid-impermeable layer through which visible reaction products of said reagent(s) will show.

Amendments to the claims have been filed as follows

1. A biological and/or chemical test stick having a core and around the core a sleeve comprising [i] a liquid-permeable layer carrying at least one reagent and [ii] an outer liquid-impermeable layer through which visible reaction product of said reagent(s) will show, layer [i] being exposable to contact with a fluid to be tested.

2. A biological and/or chemical test stick having a core comprising [a] a liquid-permeable core member at one end in longitudinal alignment with [b] a liquid-impermeable core member, and around the core a sleeve comprising [c] a liquid-permeable layer in communication with the liquid-permeable core member and carrying at least one reagent and [d] an outer liquid-impermeable layer through which visible reaction products of said reagent(s) will show.